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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/043,860	01/09/2002	Chi-Wen Liu	67,200-624	8436

7590 09/30/2003

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EXAMINER
DEO, DUY VU NGUYEN

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 09/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/043,860	LIU ET AL.	
	Examiner	Art Unit	
	DuyVu n Deo	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 January 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2. Claims 1, 2, 10, 12-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Miller et al. (US 6,464,568).

Miller describes a method for cleaning oxidized Cu during CMP comprising: providing a wafer process surface having a layer of an oxide of a metal overlying the metal to be CMP (col. 3, line 57-60); removing the layer of an oxide of the metal according to an oxidation cleaning operation (claimed etching process) (col. 5, line 11-18, 44-46); rinsing the wafer with DI water

(claimed cleaning the wafer according to a wet cleaning process) (col. 4, line 52-54; table 1: example #5); CMP the wafer including applying an abrasive slurry to the wafer surface (table 1: example #5; col. 5, line 66-col. 6, line 6).

Referring to claims 2, 14, the oxide of the metal is copper oxide (col. 3, line 57-60).

Referring to claim 10, the slurry includes an oxidizer, which reads on claimed polishing solution forming an oxide layer in-situ over the metal (col. 6, line 4).

Referring to claim 12, the method further includes a post-polish treatment and rinse step after polishing the wafer (table 1: example #5). This would read on claimed of cleaning the wafer following the step of CMP.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 3-6, 11, 15-18 rejected under 35 U.S.C. 103(a) as being unpatentable over Miller as applied to claims 1, 10, and 13 above, and further in view of Torii (US 2002/0068451).

Unlike claimed invention, Miller doesn't describe removing the oxide of the metal by method such as dipping the wafer into a wet chemical etchant. Torii describes a same method of polishing metal where he describes removing the oxide of the metal by immersing the wafer in a wet chemical etchant (paragraph [0033]). It would have been obvious for one skill in the art at the time of the invention in light of Torii to remove the oxide by immersing the wafer in the

etchant because Torii shows a conventional method that would remove the oxide as described by Miller with a reasonable expectation of success.

Referring to claims 4 and 16, they have no patentable weight since the method for removing the oxide, used by applied prior art, is dipping the wafer into the wet chemical etchant.

Referring to claim 11, Torii further describes the polishing slurry includes oxidizing agent such as hydrogen peroxide (paragraph [0037]).

Referring to claims 5 and 17, even though Miller doesn't describe the pH of the etchant is greater than about 10; however, he describes that variation or modification can be made to the solution pH (col. 8, line 45-50) and pre-polish solution pH can be change by changing the concentration of various ingredients in the solution (col. 7, line 15-21). This would suggest that the pH is a result-effective variable that can be changed. Therefore, it would have been obvious to determine the pH of the pre-polish solution (or etchant) through routine experimentation in order to obtain optimum pH for the pre-polish solution for the removing of the metal oxide with a reasonable expectation of success.

Referring to claims 6 and 18, Miller describes the solution includes KOH (col. 8, line 33).

5. Claims 7, 8, 19, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller as applied to claims 1 and 13 above, and further in view of Torii (US 2002/0068451) and Mathuni et al. (US 4,390,394).

Unlike claimed invention, Miller doesn't describe removing the oxide of the metal using a RIE method with fluorocarbon or hydrofluorocarbon. Torii describes a same method of polishing metal where he describes the metal oxide can be removed either by a wet or dry etching process before the CMP of the metal layer (claims 2 and 3). It would have been obvious

to one skill in the art in light of Torii that using either a wet or dry etching would be the same. Therefore, at the time of the invention, using a dry etch to remove the metal oxide would be obvious to one skill in the art with a reasonable expectation of success. Furthermore, such a dry etching method as reactive ion etching with fluorocarbon or hydrofluorocarbon to remove the metal oxide is a well known method to one skill in the art as shown here by Mathuni (col. 3, line 10-12, col. 4, line 14-16).

6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miller as applied to claim 1 above, and further in view of Small (US 5,981,454).

Unlike claimed invention, Miller doesn't describe cleaning the wafer in DI water by dipping it into the cleaning liquid or spraying the cleaning liquid onto the wafer while simultaneously agitating the wafer. These methods for cleaning wafer are well known to one skill in the art at the time of the invention. Small describes various methods for cleaning the wafer including using immersion tanks (dipping the wafer into the cleaning liquid) or brush scrub and spray tools (claimed spraying and agitating the wafer) (col. 4, line 35-45). Therefore, at the time of the invention, using either dipping or spray and agitating the wafer would have been obvious to one skill in the art in order to clean the wafer with a reasonable expectation of success.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 703-305-0515.

DVD
9/16/03

NADINE G. NORTON
PRIMARY EXAMINER